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## (54) FLUORESCENT INK COMPOSITION FOR JET PRINTING

## (57)Abstract:

PROBLEM TO BE SOLVED: To obtain a fluorescent ink composition capable of forming an image of high fluorescence emission intensity and imparting high fluorescent dye concentration to the surface when printing a surface of a water-absorbing material such as paper and cloth, by mixing a fluorescent dye, water as a solvent and a specific fine solid particles.

SOLUTION: This ink composition consists of (A) a fluorescent dye, (B) water as a solvent and (C) fine transparent solid particles [the materials for example a water dispersible nylon resin obtained by grafting (meth)acrylic acid or N-methylolacrylamide onto N-methoxymethylated nylon or a water dispersible product of egg albumin and chitosan] and preferably containing 0.001-10wt.% of A, more than 50% of B and 2-45% of C.

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**[Claim(s)]**

[Claim 1] A fluorescence ink constituent for jet printing characterized by containing a transparence solid-state particle with a particle size of 1 micrometer or less in a fluorescence ink constituent for jet printing which uses water as a solvent, including fluorescent dye.

[Claim 2] A fluorescence ink constituent for jet printing according to claim 1 whose construction material of a transparence solid-state particle is water-dispersion Nylon which made N-methoxymethyl-ized nylon graft-ize an acrylic acid, a methacrylic acid, or N-methylol acrylamide.

[Claim 3] A fluorescence ink constituent for jet printing according to claim 1 whose construction material of a transparence solid-state particle is a water-dispersion albumen-chitosan reactant.

**[Detailed Description of the Invention]**

[0001]

[The technical field to which invention belongs] This invention relates to the fluorescence ink constituent for jet printing which can obtain the print of an image especially with the high fluorescence luminescence about the fluorescence ink constituent for jet printing containing fluorescent dye.

[0002]

[Description of the Prior Art] The fluorescence ink constituent for jet printing used for making images, such as printing which a printing hand-ed front face is made to breathe out the ink constituent containing fluorescent dye with an ink jet printer, and carries out firefly luminescence by the exposure of ultraviolet radiation or infrared light, a graphic form, and a line, form is indicated by official reports, such as JP,62-5079,B, JP,62-24024,B, and \*\*\*\*\* No. 500590 [ six to ], and is well-known.

[0003]

[Problem(s) to be Solved by the Invention] However, although these fluorescence ink constituents for jet printing can form the image of high firefly luminescence to a

printing hand-ed front face without absorbency For example, a printing hand-ed front face with the absorbency of paper, textiles, etc. is received. Since the fluorescent dye in an ink constituent will permeate and diffuse to the depths of a printing hand-ed with a solvent if it prints with an ink jet printer It was economically [ operationally or ] difficult to make high concentration of the fluorescent dye in a printing hand-ed front face, and it originated in that and there was a trouble that the firefly luminescence reinforcement in a printing hand-ed front face was inadequate. When the printing hand-ed [ absorbent ] was coloring with Japanese ink etc. especially, lack of the firefly luminescence reinforcement in a printing hand-ed front face had the trouble of being remarkable.

[0004] This invention is in what solves the trouble of the conventional fluorescence ink constituent for jet printing, as a lot of fluorescent dye remains on a printing hand-ed front face, it makes high concentration of the fluorescent dye in a printing hand-ed front face, and it aims at offering the fluorescence ink constituent for jet printing which can form an image with high firefly luminescence reinforcement.

[0005]

[Means for Solving the Problem] In order that this invention persons may solve said technical problem, as a result of studying many things, by making a transparence solid-state particle contain in a fluorescence ink constituent for jet printing It fixes on a front face, without these particles permeating the depths of a printing hand-ed. Moreover, since it sticks to a front face of these particles at the time of jet printing before jet printing (in namely, inside of an ink constituent before spreading) of fluorescent dye (namely, when an ink constituent is applied to a printing hand-ed front face and permeates the depths of a printing hand-ed) Osmosis to the depths of a printing hand-ed decreased, as a result, fluorescent dye concentration of a printing hand-ed front face became high, knowledge that an image with high firefly luminescence reinforcement was obtained was acquired, and this invention was completed.

[0006] That is, this invention offers a fluorescence ink constituent for jet printing characterized by containing a transparence solid-state particle with a particle size of 1 micrometer or less in a fluorescence ink constituent for jet printing which uses water as a solvent, including fluorescent dye.

[0007] This invention is explained concretely below. A fluorescence ink constituent for jet printing of this invention can use water as fluorescent dye, a transparence solid-state particle, and a solvent as an indispensable component, and can contain a hydrophilic organic solvent, and water soluble resin and various additives if needed further.

[0008] Fluorescent dye used by this invention is fluorescent dye which carries out firefly luminescence by various light, such as ultraviolet radiation, infrared light, or the light, can respond in activity eye and can be chosen suitably. For example, what is necessary is just to choose fluorescent dye suitable for it suitably, in carrying out firefly luminescence, when infrared light is irradiated although firefly luminescence is not carried out in the light. As fluorescent dye, specifically C. I. Fluorescent Brightening Agent 14, 24, 30, 32, 52, 54, 69, 79, 84, 85, 86, 87, 90, 104, 112, 113, 114, 119, 121, 134, 135, 152, 166, 167, 168, 169, 191, 192, 201, 204, 214, 216, 217, 218, 223, 226, 229, 234, 236, 239, 240, 242, 257, 260, 271, 290, 310, 311, 312, 313, 314, 315; C. I. Basic Red 1, 1-1; C. I. Basic Violet 10 and 11:1; C. -- I. Basic Yellow 35, 40, and 95; C. -- I. Basic Blue 7 ; P - quaterphenyl ; P 4-OKIZA diazole; 3-phenyl-7- - terphenyl; -- 2, 5-diphenyloxazole; -- 2-(1-naphthyl)-5-phenyl OKIZAZORU; -- 2-phenyl-5-(4-biphenyl)- 1 and 3 -- (1 and 2-2H-naphth thoria ZORIRU)-coumarin; 3, 7-screw (diethylamino) FENOKISAZONIUMU nitrate; 3, 7-screw (diethylamino) FENOKISAZONIUMU nitrate; DTTCl which is a laser color, DNTTCl, HDITCl, IR-125, 132 and 140, and H.I.D.C. Iodide etc. -- it is mentioned as a typical thing. Although what is distributed in water at dissolution or stability is desirable as for these fluorescent dye when a point of the storage stability of a fluorescence ink constituent for jet printing is taken into consideration, it is usable by making a hydrophobic thing stick to a transparency solid-state particle beforehand.

[0009] A transparency solid-state particle used by this invention is blended in order to make high fluorescent dye concentration of a printing hand-ed front face and to obtain an image with high firefly luminescence reinforcement. Namely, although fluorescent dye permeates in the case of an absorbency printing hand-ed and it is easy to diffuse it with a solvent at the depths of a printing hand-ed in it, if a transparency solid-state particle is blended into a fluorescence ink constituent for jet printing These particles remain without permeating the depths of a printing hand-ed on a front face. It sticks to a front stirrup of a particle's which remained on the printing hand-ed front face jet printing of fluorescent dye at the time of jet printing, and it controls osmosis to the printing hand-ed depths of fluorescent dye, consequently fluorescent dye concentration of a printing hand-ed front face becomes high.

[0010] What will be colored if "transparency" about a transparency solid-state particle used by this invention penetrates light in addition to transparency of perfect semantics, and a thing which has become muddy are also contained. However, what does not penetrate light is unsuitable to this invention since firefly luminescence reinforcement falls, and in order to soil a printing hand-ed. Particle size of a transparency solid-state particle is 1 micrometer or less, as nozzle \*\*\*\* of a jet printer does not arise, and when a

point it is made to be easy to remain on a front face of a printing hand-ed is also taken into consideration, it is 0.01-0.5 micrometers preferably. As these transperence solid-state particle, by minerals system, in order that titanium oxide, an iron oxide, a calcium carbonate, a barium sulfate, etc. may be mentioned as a typical thing and these minerals system particle may improve distributed stability if needed, what performed surface treatment may be used.

[0011] Moreover, a hollow-like resin particle manufactured from an acrylic-styrene copolymer given in official reports, such as JP,63-254176,A, etc. by nature system of organic; a non-hollow-like resin particle of a publication water-dispersion [ various ] etc. is mentioned to official reports, such as JP,4-337305,A, JP,5-214194,A, JP,6-16895,A, JP,6-136164,A, JP,6-298879,A, JP,6-322221,A, JP,6-322215,A, JP,7-53913,A, and JP,7-53730,A, as a typical thing. A good thing of dyeing property not only by having water-dispersion [ stable ] in this invention but fluorescent dye, For example It considers as a water-dispersion Nylon [commercial item which made N-methoxymethyl-ized nylon graft-ize an acrylic acid (meta) or N-methylol acrylamide 20 to 40% of the weight. \*\* TOREJIN FS-350, TOREJIN FS-500(all are imperial chemistry industrial company make)], and water dilution of an albumen are set to pH 3-4 with an acid. After adding and carrying out the pyrogenetic reaction of chitosan and the aldehyde system cross linking agent, especially a water-dispersion albumen-chitosan reactant obtained by making it about five pH with alkali is desirable.

[0012] A solvent used by this invention is water, it is distilled water or ion exchange water preferably, and it is also possible to use together a part of water miscibility organic solvents, such as methyl alcohol, ethyl alcohol, isopropyl alcohol, dioxane, an acetone, a methyl ethyl ketone, carbitol, and dimethyl sulfoxide, if needed further.

[0013] An ink constituent of this invention contains a component explained above as an indispensable component, and it is suitable for it about these blending ratio of coal that 0.005 - 2 % of the weight and a transperence solid-state particle are [ 3 - 35 % of the weight and a solvent ] 50 % of the weight or more preferably two to 45% of the weight 0.001 to 10% of the weight for fluorescent dye.

[0014] An ink constituent of this invention so that a transperence solid-state particle may adhere to a printing hand-ed front face firmly if needed further So that a particle adhering to a nozzle of a jet printer can remove easily Moreover, polyacrylic acid, Polyacrylate, a styrene-maleic-acid copolymer, a styrene sulfonic-acid-maleic-acid copolymer, Polyester, hydroxyethyl cellulose, polyvinyl alcohol, Water soluble resin, such as a malto sill cyclodextrin and a polyethylene glycol, in 1 - 45% of the weight of an amount; lithium nitrate, Additives, such as dispersants, such as electric conductivity regulators, such as a nitrous-acid lithium, ammonium sulfite, ammonium formate,

ammonium acetate, lithium halide, and thiocyanic acid soda, and an amine conversion silicone system dispersant, and antiseptics, can be contained in 0.1 - 5% of the weight of an amount.

[0015] An ink constituent of this invention needs to have a property which was adapted for printing by ink jet printer. Therefore, as for an ink constituent, it is desirable for viscosity to be the range whose about 0.8 to 1.2 surface tension about 50 to 3000 ohm-cm and specific gravity is about 20-60 dynes/cm for about one to 10 mPa-sec (20 degrees C) and specific resistance.

[0016] An ink constituent of this invention carries out mixed stirring of all the components at once, or carries out mixed stirring of fluorescent dye, a transparence solid-state particle, and some solvents beforehand, makes fluorescent dye stick to said particle, carries out mixed stirring of these and the remainder component, and can prepare them by filtering and refining with a filter which has about 1 / ten or less pore size of a diameter of a nozzle of an ink jet printer subsequently used.

[0017] As an ink jet printer which can carry out jet printing using an ink constituent of this invention, various well-known printers can be used from the former, and an electrification control system, ink on demand, a method that makes an ink constituent breathe out by thermal head are specifically held as a typical thing.

[0018]

[Example] An example and the example of a comparison explain this invention below at details. In addition, weight criteria show the "section" and "%" in an example and the example of a comparison.

After mixing fluorescent dye, a transparence solid-state particle, water soluble resin, an additive, and a solvent to homogeneity by the blending ratio of coal (unit: section) shown in one to examples 1-6 and example of comparison 4 table 1, the pore size 5.0micrometer membrane filter filtered and refined, and the ink constituent corresponding to each example and the example of a comparison was prepared. Dot printing was carried out, the printing was used for the postcard which smeared away the postcard each ink constituent of whose is not printed with an ink jet printer, and its front face in India ink with the spectrophotofluorometer, and firefly luminescence reinforcement was measured. The result is shown in the lower berth of a table 1.

[0019] In addition, in examples 1-2 and the example 1 of a comparison, firefly luminescence reinforcement [ in / for the firefly luminescence reinforcement when irradiating 365nm excitation light / the non-printed postcard of the example 1 of a comparison ] was shown as a relative value at the time of being referred to as 100. Moreover, in examples 3-4 and the example 2 of a comparison, firefly luminescence reinforcement [ in / for the firefly luminescence reinforcement when irradiating 655nm

excitation light / the non-printed postcard of the example 2 of a comparison ] was shown as a relative value at the time of being referred to as 100. Moreover, in the example 5 and the example 3 of a comparison, firefly luminescence reinforcement [ in / for the firefly luminescence reinforcement when irradiating 825nm excitation light / the non-printed postcard of the example 3 of a comparison ] was shown as a relative value at the time of being referred to as 100. Moreover, in the example 6 and the example 4 of a comparison, firefly luminescence reinforcement [ in / for the firefly luminescence reinforcement when irradiating 795nm excitation light / the non-printed postcard of the example 4 of a comparison ] was shown as a relative value at the time of being referred to as 100.

[0020]

[A table 1]

組 成		実 施 例		比較例	実 施 例		比較例	実 施 例		比較例	実 施 例		比較例
		1	2	1	3	4	2	5	3	6	4		
蛍 光 染 料	C.I. Basic Red 1-1	0.04	0.04	0.04									
	C.I. Basic Yellow 40	0.04	0.04	0.04									
	H.I.D.C. Iodide				0.02	0.02	0.02						
	IR-140							0.01	0.01				
	IR-125									0.01	0.01		
透 明 固 体 微 粒 子	アクリル-スチレン共重合体中空 状樹脂粒子のスルホン酸系界面活 性剤入り水分散液 (NV48%、平均粒径 0.5μm)	30											
	アクリル樹脂系非中空状樹脂粒子 (平均粒径 0.2μm)				25								
	N-メトキシメチル化ナイロンの アクリル酸グラフト体であるナイ ロン樹脂粒子の水分散液 (NV20%、平均粒径 0.05 μm)		60					60					
	卵白-キトサン反応物粒子水分散液 (NV5%、平均粒径0.05μm)					80							
	透明酸化鉄 (平均粒径0.05μm)									11			
水 溶 性 樹 脂	ヒドロキシエチルセルロース						10						
	ポリアクリル酸塩			10						4	15		
	ポリビニルアルコール								7				
溶 媒	イオン交換水	65	36	85	70	15	85	25	78	80	80		
	エチルアルコール	5	5	5	5	5	5	5	5	5	5		
	ジメチルスルホキシド							10	10				
アミン変性シリコン系分散剤					0.2					0.2			
蛍 光 発 光 強 度	無印刷ハガキ (A)	135	145	100	130	140	100	145	100	135	100		
	墨塗りハガキ (B)	20	30	5	15	25	3	30	3	15	5		
	蛍光発光強度比(B)/(A) (%)	15	21	5	12	18	3	21	3	11	5		

[0021] In the examples 1-6 which are the ink constituents of this invention, firefly luminescence reinforcement was high and the firefly luminescence intensity ratio to a Japanese ink coating postcard and a non-printed postcard was also 10% or more so that clearly from the data shown in a table 1. In the examples 1-4 of a comparison which, on the other hand, do not contain a transparency solid-state particle, firefly luminescence reinforcement was all low.

[0022]

[Effect of the Invention] Since the fluorescence ink constituent for jet printing of this invention contains the transparence solid-state particle, even if it prints it to a liquid absorption printing hand-ed, the fluorescent dye concentration in a printing hand-ed front face becomes high, and it can form an image with high firefly luminescence reinforcement.